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Mr. Lynn's results for 1878 were:—

	$''$
From Meridian observations	−8·23
,, Altazimuth ,,	−7·48

They are as nearly accordant with the empirical theory as could be expected. The errors in 1876 are apparently 2″ greater than theory. This may be due in part to inequalities not yet discovered, but is more likely to arise from systematic errors of a personal character in noting the times of transit of the Moon's limb. For several years preceding 1876 the Moon's R.A. as observed at Greenwich and Washington was some 1″ or 2″ greater than that derived from occultations, and from the meridian observations to other Observatories. Hence arose the constant difference between the corrections for 1875·0 found by Captain Tupman from observations at a number of Observatories and by myself from Greenwich and Washington alone. The occultations seem to show that the constant error was in my own results.

On the whole, I do not yet see any good reason to believe that the course of the errors during the next six years will be materially different from that above given. It would be a matter of interest if the few Observatories where the Moon is systematically observed would, after the end of each year, publish the mean correction to the Moon's longitude derived from the observations of the year.

On Recent Changes in the Mean Error of Longitude of Hansen's Lunar Tables.

By W. T. Lynn, B.A.

The critical point apparently reached in the mean error of longitude of the Moon, as assigned by Hansen's Tables, has led me to examine its circumstances a little more minutely than in my previous paper printed in the last *Supplementary Notice*; and, by the permission of the Astronomer Royal, I beg to offer the Society the following results of that examination.

It will have been noticed that the diminution of the error in 1878, to which I called attention as above, is shown by the observations made both with the meridian and altazimuth instruments. But in what follows I have discussed the altazimuth observations only, which are not only more numerous, but distributed through a larger part of each lunation than those made with the Transit-Circle.

My previous paper left it doubtful whether the turning point was in the year 1876 or 1877. I have now compared the mean error of longitude from the altazimuth observations in 1877,

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which are 182 in number, and find it to be $+8''{\cdot}25$. (I may take the opportunity of mentioning that I detected a mistake in the result of the observation as printed (and shortly to be published) on February 26 for that year, when the error in longitude should be $+10''{\cdot}90$ instead of $+11''{\cdot}79$.) As this mean error was $+9''{\cdot}31$ in 1876, it is evident that it had reached a *maximum* in that year.

Now, for the purpose of ascertaining what the amounts of fluctuation of the error in the course of separate years were, I have put together the number of days in 1877 and 1878 in which the error of longitude was contained between each pair of consecutive seconds of its whole range. The following Table exhibits the result of that comparison :—

Error of Longitude.				No. of Days	
	″		″	in 1877.	in 1878.
Between	−4	and	−3	2	0
,,	−3	,,	−2	0	1
,,	−2	,,	−1	0	3
,,	−1	,,	0	1	2
,,	0	,,	1	2	4
,,	1	,,	2	5	7
,,	2	,,	3	9	3
,,	3	,,	4	7	7
,,	4	,,	5	15	10
,,	5	,,	6	10	14
,,	6	,,	7	18	18
,,	7	,,	8	14	17
,,	8	,,	9	17	20
,,	9	,,	10	19	17
,,	10	,,	11	12	13
,,	11	,,	12	22	9
,,	12	,,	13	11	7
,,	13	,,	14	11	1
,,	14	,,	15	2	3
,,	15	,,	16	2	1
,,	16	,,	17	0	2
,,	17	,,	18	1	1
,,	18	,,	19	1	1
,,	19	,,	20	0	0
,,	20	,,	21	1	0

It results from this comparison that in 1877 the proportion 0·70, and in 1878 the proportion 0·73 of the whole of the errors

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were contained between the limits +4″ and +12″; also that in neither was there more than a single observation, the error from which was included between two seconds of which the smallest was +17″.

In 1878, it will have been remarked that the number of altazimuth observations is considerably under the average, and the same will undoubtedly be the case for the current year also, the state of the sky for more than a year past having been very unfavourable for observations. An examination of the observations hitherto made during 1879 (embracing, of course, now by far the largest part of the year) shows* that the mean error in longitude is larger than in 1878, and about the same as in 1877; also that it has been increasing during the year, and that the mean value for the first three quarters (January to September) is about +8″·9.

I may mention that some time ago I compared the mean error of longitude for several years as resulting from the observations made in the different quarters of each lunation. In no case did I find any appreciable difference in the mean error for the first and second, or for the third and fourth quarters of each of different lunations. There was, indeed, a decided difference between the mean error in the first and second *halves* of the lunation, or the error from observations made before and after the Full Moon. But this may, of course, arise in great measure from the difference in the method of observing the first and the second limb of the Moon respectively; on which there is a well-known paper by Mr. Dunkin in the *Monthly Notices* for 1869, April 9 (vol. xxix. page 259), in which he shows how this varies for different observers.

Recently I have made a fresh determination of the apparent diameter of the Moon as resulting from the altazimuth observations from 1862 to 1878. This too varies very much for different observers; but the mean result seems to show that the correction to the semi-diameter adopted by Hansen, as used in the *Greenwich Observations* since 1863, is somewhat too large, both in azimuth and zenith distance. A change in the former, however, would make but little difference in the mean result; because the number of observations of the first and second limbs respectively in each year is very nearly the same. The semi-diameter used in zenith distance is more effective in the mean result; since, on an average, about three times as many lower as upper limbs of the Moon are observed. But then the mean

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* The results for the first three quarters of the year (all now reduced) are as follows:—

		No. of Obs.	Mean Error in Longitude.
			″
1879	January to March	28	+8·25
„	April to June	42	+8·69
„	July to September	47	+9·48

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error of zenith distance produces a comparatively small effect on the mean error of longitude.

Blackheath,
1879, *Nov.* 24.

Addendum.

By the request of Mr. Neison, I have calculated the mean error in longitude for 1878 in two divisions—up to June 1 and after that date. Before June 1 there were 61 observations made with the altazimuth, of which the resulting mean error of longitude is + 7″·54; after June 1 there were 100 observations, and the corresponding resulting mean error is + 7″·44. So that the observations in the earlier and later part of that year give results almost identical with each other.

A question having been raised as to how far the changes in the mean error may have been affected by changes in the observers, and in their personality in observing, I have also put together the results of the observations of Mr. Criswick alone, who has been for several years the standard observer at the Royal Observatory, and whose observations extend regularly through the whole of the period during which Hansen's Tables have been used. The following are the resulting mean errors of longitude from the Transit-Circle observations made by him on the separate years specified:—

Year.	No. of Observations.	Mean Error of Longitude by Transit-Circle. ″
1862	15	−2·70
1866	21	+2·94
1870	21	+4·61
1874	25	+8·80
1878	18	+7·74

1879, *Dec.* 22.

Note on the North Polar Distances of the Greenwich Seven-Year Catalogue for 1860. By A. M. W. Downing.

In a communication to the Society at the November Meeting Mr. Stone has given the results of a comparison between the North Polar Distances of his great Catalogue and those of the *Nautical Almanac*; and has deduced the remarkable result that the adopted refractions are too large for the observations made at the Cape during the dry season in November, December, and January, and too small for the observations made at the opposite season of the year. I have examined my comparison of the